CLAIMS

What is claimed is:

1. A liquid crystal display device, comprising:
an upper electrode;
a lower electrode;
an alignment layer in contact with either of said upper electrode or said lower electrode to form a lower assembly and an upper assembly; and
a liquid crystal display material, disposed between the upper assembly and the lower assembly;
wherein the upper assembly and the lower assembly are designed relative to each other, based on at least one surface potential measurement, to create a substantially predetermined surface potential difference between the upper assembly and the lower assembly;
such that an intrinsic DC offset potential in said liquid crystal display device is within a designed range.

2. A liquid crystal display device, as in claim 1, wherein material is selected for said lower electrode and said upper electrode, such that a surface potential difference between the lower assembly and the upper assembly, is adjusted and the intrinsic DC offset potential in said liquid crystal display device is changed.

3. A liquid crystal display device, as in claim 1, wherein material for said lower electrode is selected for the lower assembly, the material for said lower electrode having a measured surface potential and material for said upper electrode is selected for the upper assembly of said liquid crystal display device, the material for said upper electrode having a surface potential that is substantially similar to a surface potential of the material for said lower electrode.

4. A liquid crystal display device, as in claim 1, wherein at least one of said upper electrode and said lower electrode, is treated such that a surface potential

difference between the lower assembly and the upper assembly, of said liquid crystal display device, is adjusted and the intrinsic DC offset potential is changed.

5. A liquid crystal display device, as in claim 4, wherein, at least one of said upper electrode and said lower electrode is treated by firing in an atmosphere selected from the group consisting of H2, N2, and combination H2/N2.

6. A liquid crystal display device, as in claim 4, wherein at least one of said upper electrode and said lower electrode is treated by etching.

7. A liquid crystal display device, as in claim 1, wherein at least one of said upper electrode and said lower electrode is treated, such that a surface potential of at least one of said upper electrode and said lower electrode is changed.

8. A liquid crystal display device, as in claim 1, wherein passivation layer material is selected and disposed on at least one of said upper electrode and said lower electrode to form at least one of the lower assembly and the upper assembly wherein a surface potential of an assembly formed thereby is altered, such that a surface potential difference between the lower assembly and the upper assembly is adjusted and the intrinsic DC offset potential in said liquid crystal display device is changed.

9. A liquid crystal display device, as in claim 8, wherein the surface potential of the assembly formed thereby is altered, resulting in a decrease in the surface potential.

10. A liquid crystal display device, as in claim 8, wherein the surface potential of the assembly formed thereby is altered, resulting in an increase in the surface potential.

11. A liquid crystal display device, as in claim 1, wherein a passivation layer is selected from at least one of BCB, NHC, MgO, SiO_2, Al_2O_3, SiN_2, MgF_2, and

$MgAl_2O_4$ and the passivation layer is disposed on at least one of said upper electrode and said lower electrode to form an assembly, wherein the way the passivation layer is disposed is selected from at least one of sputtering by chemical vapor deposition (CVD), plasma-enhanced CVD, evaporation, spin-coating, meniscus and roller-coating; such that a surface potential difference between the assembly formed thereby and a second assembly of said liquid crystal display device, is adjusted.

12. A liquid crystal display device, as in claim 11, wherein the passivation layer is selected and disposed on at least one of said upper electrode and said lower electrode to form the second assembly.

13. A liquid crystal display device, as in claim 1, wherein materials for said alignment layer are selected and disposed on at least one of said upper electrode and said lower electrode to form an assembly wherein a surface potential of the assembly is altered, such that a surface potential difference between the lower assembly and the upper assembly is adjusted and the intrinsic DC offset potential in said liquid crystal display device is changed.

14. A liquid crystal display device, as in claim 13, wherein the surface potential of the assembly formed thereby is altered, resulting in a decrease in the surface potential.

15. A liquid crystal display device, as in claim 13, wherein the surface potential of the assembly formed thereby is altered, resulting in an increase in the surface potential.

16. A liquid crystal display device, as in claim 13, wherein the materials selected for said alignment layer disposed on the lower assembly are different.

17. A liquid crystal display device, as in claim 13, wherein the materials selected for said alignment layer disposed on the upper assembly are different.

18. A liquid crystal display device, as in claim 1, wherein said alignment layer is treated such that a surface potential difference between the lower assembly and the upper assembly, of said liquid crystal display device, is adjusted.

19. A method, as in claim 18, wherein said alignment layer is treated by doping with an ionic salt, whereby the surface potential difference is changed.

20. A liquid crystal display device, comprising:

an upper electrode;

a lower electrode;

alignment layers in contact with at least one of said upper electrode or said lower electrode to form an upper assembly and a lower assembly; and

a liquid crystal display material, disposed between the upper assembly and the lower assembly;

wherein the upper assembly and the lower assembly are designed relative to each other to create a substantially predetermined surface potential difference between the upper assembly and the lower assembly;

such that an intrinsic DC offset potential in said liquid crystal display device is within a designed range.

21. A method of measuring a surface potential of an assembly of a liquid crystal display device, said method comprising:

connecting a terminal of an electric field measuring device to an electrode of the assembly of the liquid crystal display device;

placing a measurement probe of the electric field measuring device proximate to a surface of the assembly of the liquid crystal display device; and

measuring the surface potential of the assembly of the liquid crystal display device with the electric field measuring device.

22. A method of measuring a surface potential difference of a liquid crystal display device, said method comprising:

connecting a terminal of an electric field measuring device to an electrode from an upper liquid crystal display assembly;

placing a measurement probe of the electric field measuring device proximate to a surface of the upper liquid crystal display assembly that will contact a first surface of a liquid crystal layer of the liquid crystal display device when assembled;

measuring a surface potential of the surface of the upper liquid crystal display assembly with the electric field measuring device; and

repeating said connecting, placing, and measuring relative to a lower liquid crystal display assembly to obtain a surface potential of the lower liquid crystal display assembly that will contact a second surface of the liquid crystal layer of the liquid crystal display device when assembled;

such that when the surface potential of the upper liquid crystal display assembly and the surface potential of the lower liquid crystal display assembly are mathematically combined, the surface potential difference is obtained.

23. A method of changing an intrinsic DC offset potential in a liquid crystal display device, said method comprising:

selecting material for a lower electrode and an upper electrode, of the liquid crystal display device, such that a surface potential difference between a lower assembly and an upper assembly, of the liquid crystal display device, is adjusted and the intrinsic DC offset potential in the liquid crystal display device is changed.

24. A method of changing an intrinsic DC offset potential in a liquid crystal display device, said method comprising:

selecting lower electrode material, for a lower assembly of the liquid crystal display device, wherein the lower electrode material has a measured surface potential; and

selecting upper electrode material, for an upper assembly of the liquid crystal display device, having a surface potential that is substantially similar to the surface potential of the lower electrode material.

25. A method of changing an intrinsic DC offset potential in a liquid crystal display device, said method comprising:

treating at least one electrode, of the liquid crystal display device, such that a surface potential difference between a lower assembly and an upper assembly, of the liquid crystal display device, is adjusted and the intrinsic DC offset potential is changed.

26. A method, as in claim 25, wherein said treating further comprises firing at least one electrode in an atmosphere selected from the group consisting of H2, N2, and combination H2/N2.

27. A method, as in claim 25, wherein said treating further comprises etching at least one electrode.

28. A method of changing an intrinsic DC offset potential in a liquid crystal display device, said method comprising:

treating at least one electrode, of the liquid crystal display device, such that a surface potential of the electrode is changed subsequent to said treating.

29. A method of changing an intrinsic DC offset potential in a liquid crystal display device, said method comprising:

selecting passivation layer material; and

disposing passivation layer material on an electrode, of the liquid crystal display device to form an assembly;

wherein a surface potential of the assembly, after said disposing passivation layer material, is altered;

such that a surface potential difference between a lower assembly and an upper assembly, of the liquid crystal display device, is adjusted and the intrinsic DC offset potential in the liquid crystal display device is changed.

30. A method, as in claim 29, wherein a surface potential of the assembly after said disposing passivation layer material, is altered resulting in a decrease in the surface potential.

31. A method, as in claim 29, wherein a surface potential of the assembly after said disposing passivation layer material, is altered resulting in an increase in the surface potential.

32. A method of changing an intrinsic DC offset potential in a liquid crystal display device, said method comprising:

selecting a passivation layer from at least one of BCB, NHC, MgO, SiO2, Al2O3, SiN2, MgF2, and MgAl2O4; and

disposing the passivation layer on at least one electrode to form an assembly, wherein said disposing is selected from at least one of sputtering by chemical vapor deposition (CVD), plasma-enhanced CVD, evaporation, spin-coating, meniscus and roller-coating;

such that a surface potential difference between the assembly and a second assembly of the liquid crystal display device, is adjusted.

33. A method, as in claim 32, further comprising said selecting a passivation layer and said disposing the passivation layer to form the second assembly.

34. A method of changing an intrinsic DC offset potential in a liquid crystal display device, said method comprising:

selecting alignment layer material; and

disposing alignment layer material on an electrode, of the liquid crystal display device to form an assembly;

wherein a surface potential of the assembly after said disposing alignment layer material, is altered;

such that a surface potential difference between a lower assembly and an upper assembly, of the liquid crystal display device, is adjusted and the intrinsic DC offset potential in the liquid crystal display device is changed.

35. A method, as in claim 34, wherein a surface potential of the assembly after said disposing alignment layer material, is altered resulting in a decrease in the surface potential.

36. A method, as in claim 34, wherein a surface potential of the assembly after said disposing alignment layer material, is altered resulting in an increase in the surface potential.

37. A method, as in claim 34, wherein materials selected for alignment layer disposed on the lower assembly are different

38. A method, as in claim 34, wherein materials selected for the alignment layer disposed on the upper assembly are different.

39. A method of changing an intrinsic DC offset potential in a liquid crystal display device, said method comprising:

treating at least one alignment layer, of the liquid crystal display device, such that a surface potential difference between a lower assembly and an upper assembly, of the liquid crystal display device, is adjusted

40. A method, as in claim 39, wherein said treating further comprises doping the at least one alignment layer with an ionic salt, whereby the surface potential difference is changed.

41. A method of changing an intrinsic DC offset potential in a liquid crystal display device, said method comprising:

increasing the thickness of at least one layer, applied to an electrode of the liquid crystal display device, such that a surface potential difference between a lower assembly and an upper assembly, of the liquid crystal display device, is adjusted.

42. A method of changing an intrinsic DC offset potential in a liquid crystal display device, said method comprising:

decreasing the thickness of at least one layer, applied to an electrode of the liquid crystal display device, such that a surface potential difference between a lower assembly and an upper assembly, of the liquid crystal display device, is adjusted.

43. A liquid crystal display device, as in claim 13, wherein the materials selected for said alignment layer disposed on the lower assembly are the same.

44. A liquid crystal display device, as in claim 13, wherein the materials selected for said alignment layer disposed on the upper assembly are the same

45. A method, as in claim 34, wherein materials selected for the alignment layer disposed on the lower assembly are the same.

46. A method, as in claim 34, wherein materials selected for the alignment layer disposed on the upper assembly are the same.